Perspective

Sanitation Systems (/perspective/sanitation-systems-perspective)

Section

Sanitation Technologies (/sanitation-systems/sanitation-technologies)

Factsheet

Application of Sludge

العربية (/ar/sanitation-systems/sanitation-technologies/application-of-sludge)

Applicable to

System 1 (/humanitarian-crises/rural-settings/sanitation/sanitation-systems/system-1%3A-single-pit-system)
System 5 (/sanitation-systems/sanitation-systems/system-5%3A-biogas-system)
System 6 (/humanitarian-crises/rural-settings/sanitation/sanitation-systems/system-6%3A-blackwater-treatment-system-with-infiltration)
System 7 (/humanitarian-crises/rural-settings/sanitation/sanitation-systems/system-7%3A-blackwater-treatment-system-with-effluent-transport)
System 8 (/humanitarian-crises/urban-settings/sanitation/sanitation-systems/system-8%3A-blackwater-transport-to-%28semi-%29-

Application level

- City
- Household
- Neighborhood

Management level

- Household
- Public
- Shared

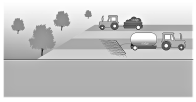
Inputs

- Sludge

Outputs

- Biomass

centralized-treatment-system)
System 9 (/sanitation-systems/sanitation-systems/system-9%3A-sewerage-system-with-urine-diversion)



Author/Compiled by
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Adapted from

Compendium of Sanitation Systems and Technologies. 2nd Revised Edition (/node/5587)

Executive Summary

Depending on the treatment type and quality, digested or stabilized sludge can be applied to public or private lands for landscaping or agriculture.

Advantages

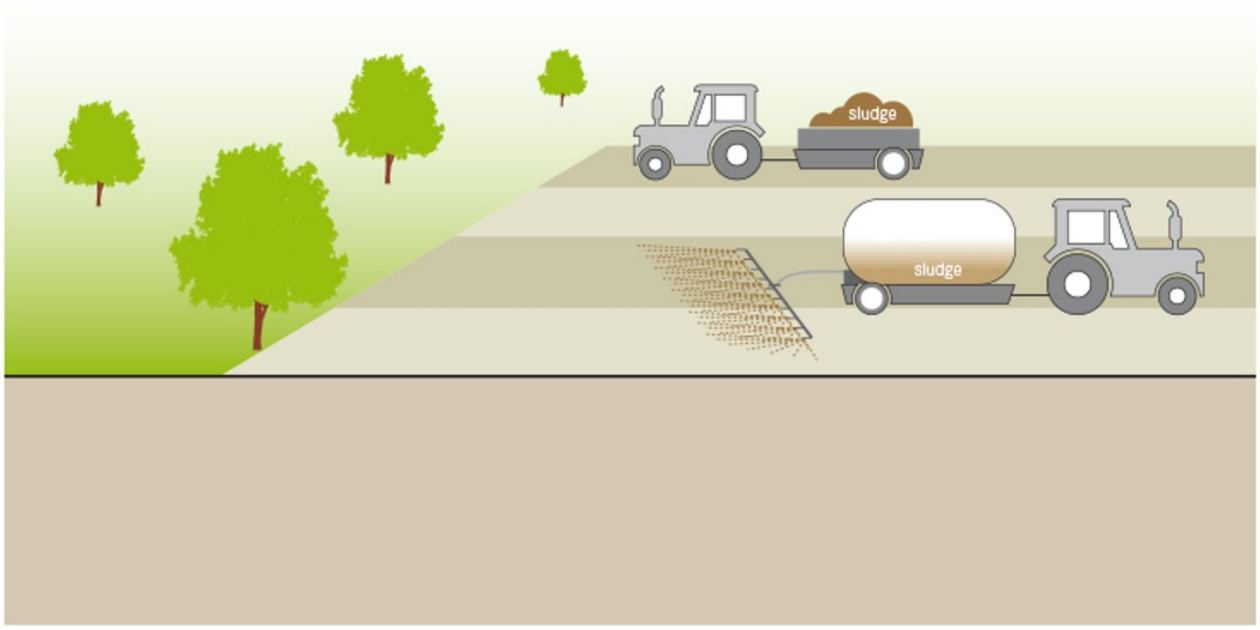
- Can reduce the use of chemical fertilizers and improve the water-holding capacity of soil
- Can accelerate reforestation
- Can reduce erosion
- Low cost

Disadvantages

- Odours are normally noticeable, depending on prior treatment
- May require special spreading equipment
- May pose public health risks, depending on its quality and application
- Micropollutants may accumulate in the soil and contaminate groundwater
- Social acceptance may be low in some areas

Introduction

Sludge that has been treated (e.g., **co-composted (/sswm-university-course/module-6-disaster-situations-planning-and-preparedness/further-resources/%28co-%29-composting-%28large-scale%29)** or removed from a **planted drying bed (/factsheet/planted-drying-beds)**, etc.) can be used in agriculture, home gardening, forestry, sod and turf growing, landscaping, parks, golf courses, mine reclamation, as a dump cover, or for erosion control. Although sludge has lower nutrient levels than commercial fertilizers (for nitrogen, phosphorus and potassium, respectively), it can replace them fully or in part. Additionally, treated sludge has been found to have properties superior to those of fertilizers, such as bulking and water retention properties, and the slow, steady release of nutrients.



Schematic of Application of Sludge. Source: TILLEY et al. (2014)

Design Considerations

Solids are spread on the ground surface using conventional manure spreaders, tank trucks or specially designed vehicles. Liquid sludge (e.g., from **anaerobic reactors (/arctic-wash/module-4-technology/further-resources-wastewater-treatment/anaerobic-digestion-%28small-scale%29)**) can be sprayed onto or injected into the ground.

Application rates and usage of sludge should take into account the presence of **pathogens and contaminants (/arctic-wash/module-2-environment-pollution-levels-implications/further-resources-environment-and/pathogens-%26-contaminants-)**, and the quantity of nutrients available so that it is used at a sustainable and agronomic rate.

Health Aspects/Acceptance

The greatest barrier to the use of sludge is, generally, acceptance. However, even when sludge is not accepted by agriculture or local industries, it can still be useful for municipal projects and can actually provide significant savings (e.g., mine reclamation).

Depending on the source of the sludge and on the treatment method, it can be treated to a level where it is generally safe and no longer generates significant odour or vector problems. Following appropriate safety and application regulations is important. **WHO guidelines on excreta use in agriculture (/node/1486)** (Volume IV) should be consulted for detailed information.

Operation & Maintenance

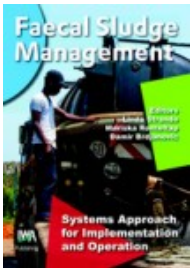
Spreading equipment must be maintained to ensure continued use. The amount and rate of sludge application should be monitored to prevent overloading and, thus, the potential for nutrient pollution. Workers should wear appropriate protective clothing.

Applicability

Although sludge is sometimes criticised for containing potentially high levels of metals or contaminants, commercial fertilizers are also contaminated to varying degrees, most likely with cadmium or other heavy metals. Faecal sludge from pit latrines should not have any chemical inputs and is, therefore, not a high-risk source of heavy metal contamination. Sludge that originates at large-scale wastewater treatment plants is more likely to be contaminated since it receives industrial and domestic chemicals, as well as surface water run-off, which may contain hydrocarbons and metals. Depending on the source, sludge can serve as a valuable and often much-needed source of nutrients. Application of sludge on land may be less expensive than disposal.

Library References

Faecal Sludge Management



This is the first book to compile the current state of knowledge on faecal sludge management. It addresses the organization of the entire faecal sludge management service chain, from the collection and transport of sludge, to the current state of knowledge of treatment options, and the final end use or disposal of treated sludge. It presents an integrated approach that brings together technology, management, and planning, based on Sandec's 20 years of experience in the field. It also discusses important factors to consider when evaluating and upscaling new treatment technology options. The book is designed for undergraduate and graduate students, engineers, and practitioners in the field who have some basic knowledge of environmental and/or wastewater engineering.

STRANDE, L. ; RONTELTAP, M. ; BRDJANOVIC, D. (2014): Faecal Sludge Management. Systems Approach for Implementation and Operation. London: IWA Publishing **URL (http://www.sandec.ch/fsm_book)** [Accessed: 16.07.2014]

Biosolids Generation, Use, and Disposal in the United States

This report gives an overview on the use and disposal of biosolids/sewage sludge in the US between 1998 and 2010.

U.S. EPA (1999): Biosolids Generation, Use, and Disposal in the United States. Washington: United States Environmental Protection Agency **URL (https://www.epa.gov/biosolids/biosolids-generation-use-and-disposal-united-states)** [Accessed: 26.05.2019]

A Plain English Guide to the EPA Part 503 Biosolids Rule

U.S. EPA (1994): A Plain English Guide to the EPA Part 503 Biosolids Rule. Washington: : United States Environmental Protection Agency (U.S. EPA) **URL (https://www.epa.gov/biosolids/plain-english-guide-epa-part-503-biosolids-rule)** [Accessed: 26.05.2019]

Guidelines for the safe use of wastewater excreta and greywater. Volume IV. Excreta and Greywater Use in Agriculture

Volume IV of the Guidelines for the Safe Use of Wastewater, Excreta and Greywater recognizes the reuse potential of wastewater and excreta (including urine) in agriculture and describes the present state of knowledge as regards potential health risks associated with the reuse as well as measures to manage these health risks following a multi-barrier approach.

WHO (2006): Guidelines for the safe use of wastewater excreta and greywater. Volume IV. Excreta and Greywater Use in Agriculture. Geneva: World Health Organisation (WHO) **URL (https://www.who.int/water_sanitation_health/publications/gsuweg4/en/)** [Accessed: 09.05.2019] **PDF (/sites/default/files/reference_attachments/WHO%202006%20Guidelines%20for%20the%20safe%20use%20of%20wastewater%20excreta%20and%20greywa**

(/sites/default/files/reference_attachments/WHO%202006%20Guidelines%20for%20the%20safe%20use%20of%20wastewater%20excreta%20and%20greywa